

Neurosciences in Québec

Position statement summary

Conseil de la science et de la technologie

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This position statement comes in the wake of a CEST initiative focusing on some of the cutting-edge scientific and technological sectors, such as nanotechnology and bioinformatics. However, the case of neuroscience stands out from the other two in that it is a research field that is already well developed in Québec and not an emerging area that would need to be built from the bottom up.

1 GENERAL PRESENTATION AND THE SOCIO-ECONOMIC IMPORTANCE OF NEUROSCIENCE

Biomedical research is at the core of neuroscience. It involves describing and characterizing the organization and functioning of the nervous system in order to better target therapeutic interventions (care, medication, surgery, etc.) and make them more effective. In addition, due to the important role of the nervous system in the human organism, neuroscience research has applications in a number of other fields of medical specialization, such as psychiatry, cardiology, immunology, ophthalmology, etc. Other scientific disciplines, such as biochemistry and organic chemistry, extend and complete neuroscience research in certain fundamental and applied aspects, as do mathematics and engineering initiatives, especially with respect to neuronal networks (neuron engineering) and artificial intelligence. Lastly, the subjects of neuroscience study, whether learning, mental illness, addictions, or damage to the nervous system (diseases and lesions), all include significant social dimensions. Neuroscience works in tandem with specific fields from the social and human sciences, for instance certain specialized areas from the field of education that examine conditions fostering cognition, the sociological and epidemiological study of the causes of suicide and mental illness, the designing of rehabilitation services for drug addicts, etc.

Neuroscience addresses a few of the problems that most seriously affect contemporary societies the world over. According to estimates from the mid 1990s published by the World Health Organization (WHO) and the World Bank, nervous traumatism, degenerative neurological diseases (for instance, Alzheimer's and Parkinson's), psychiatric and mental disorders, as well as cognitive dysfunctions may represent an astonishing 25 percent of the economic burden that can be attributed to illness and disease¹. In Canada, we have uncovered over one thousand diseases and disorders of the brain and nervous system directly affecting four million adults and children and representing the main cause of disability². Neuroscience helps us to better understand, and perhaps in the long run to prevent, many other psychological and social problems that Québec society is currently facing. The suicide rate, for instance, seems to be on the rise, whereas it is generally declining in other industrialized countries³. The problems of addiction and pathological gambling not only affect the adult population, but even high school students as well⁴.

¹ Dr. Leanna Read, *Brain and Mind Disorders : Impact of the Neurosciences*, PMSEIC, Australia, Commonwealth Government, 2003.

² NeuroScience Canada, *Welcome* (on line) <http://www.neurosciencecanada.ca/fra/topFR.html> (page consulted February 10, 2004).

³ See Danielle St-Laurent and Clermont Bouchard, *L'épidémiologie du suicide au Québec : Que savons-nous de la situation récente? (the epidemiology of suicide in Québec : what do we know of the recent situation?)* Institut national de santé publique du Québec (Québec national public health institute), Planning, Research and Innovation Department, Knowledge-Monitoring Unit, May 2004, p. 9.

⁴ Institut de la statistique du Québec (Québec statistics institute) (Health and Well-being), *Où en sont les jeunes face au tabac, à l'alcool, aux drogues et au jeu? L'Enquête québécoise sur le tabagisme chez les élèves du secondaire (2002) (How do young people feel about smoking, drugs and gambling? Québec survey on smoking among high school students (2002))*, 3rd edition, Les Publications du Québec, 2003.

2 FINDINGS OF THE STUDY OF NEUROSCIENCE IN QUÉBEC

In spite of the fact that in Québec neuroscience represents a “ world-class health research area⁵ ”, it is still vulnerable in certain respects. The CEST has chosen to include 10 highlights from its own study of the issue in the present position statement⁶.

1. **Canada holds a strong international position in neuroscience.** A number of signs point to this conclusion. For instance, Canada was one of the founders of the International Brain Research Organization (IBRO), which is, in fact, incorporated in this country.
2. **Within Canada, Québec researchers have been highly successful in terms of receiving federal funding, especially CIHR, as well as grants from private foundations.** From 1999 to 2003, Québec received 33 percent of the \$486 million granted by CIHR and 46 percent of the \$19 million distributed since 2000 by the Multiple Sclerosis Society of Canada, the Amyotrophic Lateral Sclerosis Society of Canada (ALS), the Parkinson Society Canada and the Alzheimer Society of Canada, whereas it represents 23 percent of the Canadian population.
3. **The overall funding of neuroscience in Québec exceeded \$400 million between 1999 and 2003, i.e. an average of \$100 million per year.** In particular, Québec received \$158 million from Canadian Institutes of Health Research (CIHR), \$45.5 million from the Canada Foundation for Innovation (CFI), \$86 million in Québec funding, especially from the Fonds de la recherche en santé du Québec (Québec health research fund, or FRSQ), \$19 from Valorisation-Recherche Québec (Québec research-development fund, or VRQ) and \$15.6 from five major private funds. Also a contribution of \$44 million in private-sector funding (from 1995 to 2000) and \$30 million from foreign sources must also be added to this sum.
4. **Québec’s strongest drawing cards are McGill University, Université de Montréal and Université Laval.** Between 1999 and 2003, McGill University received 55 percent of the \$158 million received by Québec from CIHR and 34 percent of the \$25 million from the FRSQ. During the same period, Université de Montréal obtained 28 percent of the funding and 42.2 percent of all grants from the FRSQ. For its part, Université Laval received 12 percent of the \$25 million granted by the FRSQ and \$18 million from CIHR.
5. **The entire neuroscience field seems to be covered by Québec researchers who have made outstanding contributions in certain advanced sectors.** Québec researchers are interested in the normal functioning of the nervous system (cognitive functions, memory, etc.) and various pathologies and lesions that may affect it, especially Alzheimer’s disease and Parkinson’s disease, as well as in a number of fields associated with neuroscience, especially cognitive science, artificial intelligence and neurotechnology (neuroprosthetics and others).

⁵ “ Annexe IV. Des secteurs de recherche à fort potentiel en santé, en sciences naturelles et en génie “ (high-potential research sectors in health, the natural sciences and engineering), in the ministère de la Recherche, de la Science et de la Technologie, *Savoir changer le monde. Politique québécoise de la science et de l’innovation (know how to change the world : Québec sciences and innovation policy)*, 2001, pp. 163-164.

⁶ Conseil de la science et de la technologie, *Portrait statistique des neurosciences au Québec (statistical portrait of the neurosciences in Québec)*, CST, March 2005.

6. **The impact of Québec neuroscience publications does not reflect the strength of the sector in Québec.** The impact of the publications, as measured by the “average relative impact factor” (ARIF), is only at the world average (1.0), although it does slightly exceed the Canadian average (0.96). In comparison, the Québec ARIF in biomedical research and clinical medicine is higher (1.07). Given the importance of the sector in Québec, we should normally see a higher ARIF than that observed.
7. **The forming by the FRSQ of a network devoted to neuroscience has most certainly contributed to the neuroscience research effort in Québec.** Six of the networks established by the Fonds de la recherche en santé du Québec (FRSQ) are pursuing neuroscience research, with one of them having been specifically designed for this discipline, i.e. the Quebec Mental Health and Neuroscience Network (QMHNN).
8. **The number of neuroscience companies in Québec does not reflect the extent of the sums invested in research.** Although for the moment it is impossible to quantify the gap that exists between the industrial presence of neuroscience and the scope of university neuroscience research, those consulted during the preparation of this position statement regularly deplored the underuse of the pool of knowledge for economic purposes.
9. **It is impossible to gauge whether or not there are a sufficient number of neuroscience researchers and whether there will be enough PhD graduates to meet future needs.** We have absolutely no data concerning the average age of neuroscience researchers, nor any other indication as to how many will be needed in the future. As for researchers working in the private sector, their number is currently unknown. Thus it is impossible to say whether or not there are enough graduates given that the future needs of universities, companies and other potential employers remain unknown.
10. **An unknown quantity : the social value of the research.** In spite of its importance, the social value of university research in terms of its benefits for practitioners, for other groups from civil society, and for the general public is a subject that remains unexplored by the literature. Thus it is difficult to evaluate the exact situation of Québec in this area.

3 RECOMMENDATIONS : THREE FUTURE PROJECTS

There is enough potential in the neuroscience field to make Québec a world science leader having an even more decisive influence within industry, among practitioners and on the society as a whole. However, this potential will only be developed under certain conditions, depending on the will of the players from the Québec neuroscience field, as well as on the support that they receive.

The CEST deems it essential for the scientific, social and economic development of Québec to make the following three recommendations to the Fonds de la recherche en santé du Québec (FRSQ) and the ministère du Développement économique, de l'Innovation et de l'Exportation (MDEIE) :

Recommendation 1

That the Fonds de la recherche en santé du Québec (FRSQ) draw up a scientific development strategy for the neuroscience sector in conjunction with the main players concerned, including the Fonds québécois de la recherche sur la nature et les technologies (Québec nature and technology research fund, or FQRNT) and the Fonds québécois de la recherche sur la société et la culture (Québec social and cultural research fund, or FQRSC).

This strategy should include objectives and means of action with respect to scientific planning, developing future researchers, training, international networking, funding, and monitoring the global neuroscience sector.

The CEST would like to underline the need to expand neuroscience research perspectives in order to build bridges with (or even include) research being conducted concerning the social, economic and familial impacts of neurological damage, mental health, various problems with drug and other additions, crime, etc.

Recommendation 2

That the ministère du Développement économique, de l'Innovation et de l'Exportation (MDEIE), in conjunction with its main partners, promote the commercial development of neuroscience research so as to ensure the growth of an industrial sector in this area in Québec.

The objectives and means of action proposed should especially focus on the commercial development of research, risk capital, and monitoring the global neuroscience industry.

The development of the industry not only involves creating companies and consolidating those already in existence, it also includes the commercial development of university research being conducted on a partnership basis, contractual research, consultation activities, the marketing of intellectual property, and technological transfer. Since the neuroscience industry is a high-technology sector, it can flourish only through establishing solid links with the university community.

Recommendations 3

That the ministère du Développement économique, de l'Innovation et de l'Exportation (MDEIE) and its partners promote the social value of neuroscience research, along with the dissemination of information concerning this field, among members of the general public.

Efforts in this regard must be directed toward disseminating the knowledge generated by research during the initial and ongoing training of health and social service practitioners, as well as among the population as a whole.

Promoting the value of research is not limited to marketing initiatives. Those in the neuroscience field are also interested in the social value of research, which “corresponds to the development and dissemination, based on research work, of solutions and practical applications designed to improve a given situation or resolve a social problem (in the broadest sense of the term)”⁷. In the first place, increasing general awareness of the social value of research must be achieved by informing the public at large. Next, such consciousness-raising initiatives must reach practitioner-stakeholders as well. Lastly, it is important to develop and promote a feedback loop, so that researchers can take the needs of both the general public and practitioners into account.

⁷ Conseil de la science et de la technologie, La valorisation de la recherche universitaire. Clarification conceptuelle (raising the profile of university research : a conceptual clarification), work paper, December 8, 2004.